

Review comments: *Role of the Estuary in the Recovery of Columbia River Basin Salmon and Steelhead: An Evaluation of Limiting Factors*, 19 December 2003

General:

This document is well written and covers an extensive amount of literature and research (both historical and more recent) concerning juvenile salmonids use of estuarine ecosystems. It is obvious that additional review and analysis have updated knowledge and thoughts presented in the SARE report. The document thoroughly discusses salmonid use in estuarine ecosystems in the Pacific Northwest. However, we feel all comparisons between other estuaries and Columbia River estuary should be carefully thought through and described, obviously the differences between the Sixes River and the Columbia are immense. Further, the authors acknowledge the challenge in designing and implementing salmonid recovery in the estuary, “we know little about the estuary and the salmon that use the estuary”, yet the document ends stating “The questions that should be asked in any comprehensive analyses should not revolve around *if* the estuary has a role”. Acknowledging up front the limited data, and concluding with “we know” seems contradictory at best.

The paper does a thorough job of summarizing what is known about the habitat types and estimated percentages of each lost throughout the estuary. There is not a clear, strong correlation to the value or significance of each of these types, and locations, that would help to prioritize restoration efforts.

There was a fairly thorough description of predation in the estuary “proper” and plume from “piscivorous” birds, but only data provided on one piscivorous bird species. Further, no mention of survival in the lower river was included, and no information suggesting what predation/survival attributes would be included in assessing survival in the lower river, estuary, and plume as a component of recovery.

There is a considerable amount of information and data concerning the changes in water flow from historic to present. This theme was also very present in the SARE report. However, no thoughtful suggestions or recommendations have been put forth on how this might be altered as one step in salmon recovery. Additionally, no thought or mention has been forthcoming on what changes in the water flow would do to existing habitats, or those habitats being restored presently.

The limiting factors analysis was described as a means to “evaluate and rank candidate limiting factors in the estuary with respect to the potential of each factor to affect population status or suppress population specific”. Then, without specific guidance on the research needs on how to determine the best candidate factors or clearly presenting the data to support the conclusions, it was determined the two most important limiting factors are flow and habitat changes. Given recent return rates of many of the listed salmonids, it seems to state specifically our knowledge of limiting factors is premature. It seems the most important outcome of this document would have been specific testable

hypotheses on limiting factors, and guidance and suggestions on how to test these hypotheses to obtain the empirical data necessary to enhance meaningful restoration and recovery actions within the lower river, estuary, and plume environments.

1. Suggestions for minor editorial changes were not made. We expect that they will be corrected during redrafting.
2. We are aware and generally support comments already provided by the other Action Agencies. Our specific comments are not intended to duplicate those other efforts.
3. The paper would benefit from a conclusions/recommendations section that would provide a sense of where programs (e.g., research and restoration efforts) should be directed in the long-term to provide the greatest benefit to salmon populations.

Specific Comments:

Page	Para	Line	Comment
7	1	11-13	It would be helpful to recognize that the decision to focus on “identifying and modifying risk factors directly associated with large hydroelectric dams” was a regional decision, including direction from NOAA
7	2	7-10	This sentence is unclear, perhaps strike “that”
7	3	4	The information presented by Kareiva et al. (2000) and McClure et al. (2003) discusses the “first years spent rearing in the river, estuary, and ocean” with no indication if one habitat might be more important/limiting than the others.
7	4	6-8	suggest “...of landscapes <u>which</u> all <u>successfully migrating</u> juvenile and adult...”
9	2	2	there were no “performance criteria” associated with specific estuary RPA’s in the FCRPS BiOp.
9	2	15	States “it is unrealistic to presume that only abundance based metrics measured at a single point (e.g., the estuary) can adequately represent the role habitats serve in facilitating the ability of salmon to grow”, however, this is precisely the type of data being collected in the Corps funded Estuary Habitat Program under NOAA direction.
11	3	7	This should be figure 2, not 1
11	3	9-12	It is not clear what this statement is based on.
11	4	9-10	The statement “rear little in the estuary” is contrary to how fall Chinook and chum are described as using the estuary later in the document.
12	1		Is there a citation?
13	2	8	This should be figure 2, not 1

15	3	7-8	It might be better to just state, “little attention was paid to the estuary and ocean” since the reasons are debatable.
16-17			The Rich (1939) data “suggested” certain life history strategies. These suggestions should be formulated as testable hypotheses and tested, not be considered factual with empirical data at this time.
17	2	12-15	Comparison of small coastal streams and estuaries such as the Sixes to the Columbia and Snake River system is questionable. In addition, according to Table 3, most of the ESUs we are discussing only “Rarely” use the estuary for rearing.
19	1	6-8	The conclusion “...requires that the right life history types exist and the existence of the right history types depends on existence of the appropriate habitats” is a sound hypothesis. However, the connection between providing the appropriate habitats and having the right life history types available to utilize them is not clear. Some people seem to believe “build it and they will come”.
20			Please acknowledge funding sources and collaboration of other agencies here and elsewhere in the document.
21	2	13-16	Recognizes there are many “Estuarine related factors that can potentially affect population viability”, but then goes on to focus on habitat and water flow. Given that these animals are obviously very adaptable, some considerations should be given to how the different stocks may have adapted to present conditions.
22	1		This paragraph seems to mix “what we believe” with “what we know”, yet includes the threshold that “change has to be significant and based on empirical data”. To the extent practicable, testable hypotheses should be formulated and tested to insure sound science and empirical data guide limited resources in salmon recovery efforts whenever possible.

This discussion does not appear to recognize the impacts of the three major mainstem dams and one major tributary dam in Canada that are operated by BC Hydro. These dams include Keenleyside (1968), Mica (1973, power house 1977), and Revelstoke (1984) on the mainstem and Duncan (1967) on the Duncan River. The following figure shows that the hydrograph did not change appreciably until after these dams closed and began operation.

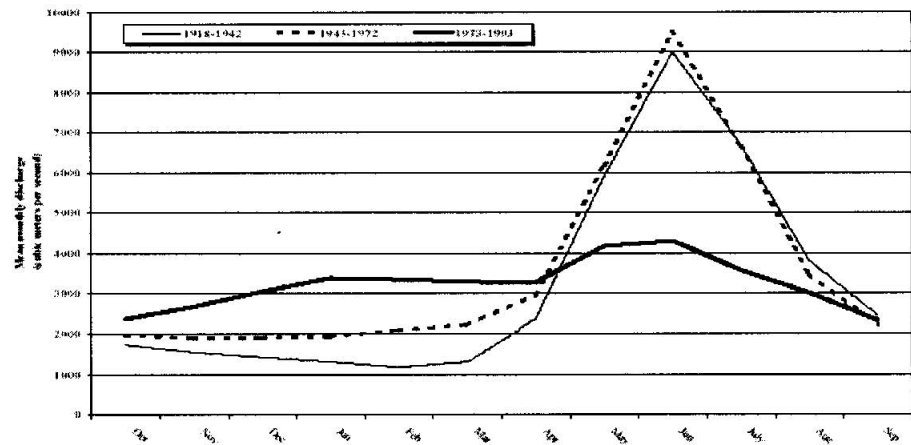


Figure 2. Columbia River Hydrograph as measured at Priest Rapids Gage. Time periods designate pre-Grand Coulee, Grand Coulee to Mica Dam, and post Mica Dam.

(Source: Anglin, D.R., P.A. Ocker, J.J. Skalicky. 1999. Section E of Ward, David L.- Oregon Dept. of Fish and Wildlife, 1999, Effects of Mitigative Measures on Productivity of White Sturgeon Populations in the Columbia River Downstream from McNary Dam, and Determine the Status and Habitat Requirements of White Sturgeon Populations in the Columbia and Snake Rivers Upstream from McNary Dam, 1997 Annual Report to Bonneville Power Administration.)

25	4		Is there a citation?
26	4	7	Is there a citation/data for the findings.
27	2	7	What is the basis for characterizing water velocities less than 30 cm/sec as important to juvenile salmonids?
30	3	5	This should refer to Figure 14 or 15.
30	3	9	It is questionable to conclude that fish are growing and rearing in the estuary based on this information since you are likely not measuring the same fish entering and leaving the estuary.
31	2-3		Comparison of the Skagit River and estuary to the Columbia River estuary is questionable given the size and character of the different systems.

32	3	9	It is unclear how the reduction of tidal swamp from Youngs Bay and Baker Bay effectively eliminates brackish water from the estuary. Also, there is no clear indication as to how important tidal swamp is to salmonids.
33	3		Is there any indication that ESA listed salmonids from the upper Columbia River Basin are using Young's Bay or used it historically?
33	4		Baker Bay is identified as potentially the most altered estuary area overall, including a large decrease in deep water habitat and increase in tidal flats. Is there any indication of the significance of this change to salmonids? Based on other statements in the paper, the shift from deep to shallow water may be beneficial.
35	4		This is also affected by flow changes that resulted from BC Hydro projects
36	4	7-10	Can you be more definitive here? Medium to low should probably be low based on this paper.
39	2	5	What stocks of fish were these?
42	1	2	Is <u>Vibrio anguillarum</u> still the correct name for the disease?
43	2		These numbers are too small to be usable.
45	3	3	Please cite the staff
46-49			Discusses "piscivorous" birds, but only provides data on Caspian terns. Other bird species should also be addressed. Also, data appears to need updating.
46	2	1-3	Tern productivity has changed and is now higher than it was on Rice Island.
47	2	4	West Coast should be Pacific Coast.
48	5	6	How was it determined that the predation rate is "50% additive" and why is this different than for other mortality factors in the system?
54	4	2	"know" should be <u>no</u>
54	4	9-17	Do we know to what extent these different life stages use the plume and can we determine from that the potential impact of changes in the plume on those life stages? How do you account for the effects of natural variation in the plume due to conditions such as weather cycles, ocean storms, etc...?
90	Figure 6		See Canadian Hydrosystem Comment above and note how it reflects on this graph.

95	Figure 11	Although showing a difference between historic and present habitat opportunity, this chart also shows that presently, with the lower flows, there may be greater rearing opportunity. Therefore one might conclude that the lower flows are better for the fish. However, considering that with lower flows the plume is likely smaller and may not push out into the ocean as far, then higher flows are important. Based on these two premises, the question comes up, which is more important, higher flows or lower flows? (Note. This is not to argue either point but to point out the ability to draw different conclusions from the same information).
97	Figure 13	Titles on the figures for years and locations are difficult to read.
98	Figure 14	Titles on the figures for years and locations are difficult to read
99	Figure 15	The values do not appear to be statistically significant. It may not be appropriate to compare a group of 10 fish to a sample size of 1200.
101	Figure 17	What percentage of these fish are ESA listed stocks?
102	Figure 18	Comparison of the Skagit River and estuary to the Columbia River estuary is questionable given the size and character of the different systems.
103	Figure 19	Comparison of the Skagit River and estuary to the Columbia River estuary is questionable given the size and character of the different systems.
106		None of these charts encompass what happened prior to BC Hydro completion and filling.
107	Figure 23	Although this information is interesting, the low numbers of fish used in the analysis does not tell us much of anything, especially with the large confidence intervals surrounding these. In addition, they do not appear to be statistically different than the hatchery component. Are these statistically comparable with such low N numbers?
108	Figure 24	See above Comment
109	Figure 25	See above comment
111	Figure 27	please identify the antigen
115-116		Were these figures cited in the text?